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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/811,924	03/30/2004	Hiroki Yoshikawa	0171-1079PUS1	3156
2292 7590 04/16/2007 BIRCH STEWART KOLASCH & BIRCH PO BOX 747 FALLS CHURCH, VA 22040-0747			EXAMINER ROSASCO, STEPHEN D	
			ART UNIT	PAPER NUMBER
			1756	
SHORTENED STATUTORY PERIOD OF RESPONSE		NOTIFICATION DATE	DELIVERY MODE	
3 MONTHS		04/16/2007	ELECTRONIC	

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Notice of this Office communication was sent electronically on the above-indicated "Notification Date" and has a shortened statutory period for reply of 3 MONTHS from 04/16/2007.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

mailroom@bskb.com

Office Action Summary

Application No.

10/811,924

Applicant(s)

YOSHIKAWA ET AL.

Examiner

Stephen Rosasco

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 February 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-27 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-27 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
 - 2) ☐ Certified copies of the priority documents have been received in Application No. _____.
 - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

Detailed Action

In response to the Remarks of 2/2/07 the examiner withdraws the prior office action rejections, indication of Allowability and includes new rejections here over newly cited art.

REMARKS – In view of applicant's statement that the claimed invention is not limited by the description in the specification that defines the term "moderately graded composition" to be a series of at least 5 steps, the examiner has withdrawn the indication of Allowability and rejected all pending claims over newly cited art.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-27 are rejected under 35 U.S.C. 102(b) as being anticipated by Mitsui (6,037,083).

Mitsui (see claims) addresses claims 1-4, 9-15 a halftone phase shift mask blank comprising a transparent substrate 10, a halftone material film 11 laminated on that transparent substrate, and a metal film 12 laminated on that halftone material film, wherein the metal film is formed by a plurality of metal films having different etching rates, and the etching rate for the metal film positioned on the transparent substrate side is set so that it is faster, either in stages or continuously, than the etching rate of the metal film positioned on the surface side.

Mitsui (see cols. 13-14) addresses claims 5-8, 22, 23 which are directed to a method for manufacturing the photomask blank comprising sputter-depositing layers on the substrate using a sputtering deposition system equipped with a plurality of targets of different compositions, across which electric powers are applied for sputtering, and gradually changing a combination of sputtering powers across the targets in proximity to the interface between layers, thereby depositing a plurality of layers of different compositions.

Mitsui (see claims, and top col. 3) addresses claims 16-27, which are directed to a phase shift mask blank comprising a substrate which is transparent to exposure light and a phase shift film thereon, said phase shift film having one side contacting the substrate and a surface side remote therefrom, said phase shift film comprising a plurality of layers containing a metal and silicon in different compositional ratios which are stacked in such order that a layer having a higher etching rate is on the substrate side and a layer having a lower etching rate is on the surface side.

Mitsui teaches in order to resolve the problems stated in the foregoing, a first invention is a halftone phase shift mask blank comprising: a transparent substrate; a halftone material film laminated on that transparent substrate; and a metal film laminated on that halftone material film; wherein: the metal film is configured with materials having differing etching rates, as the etching proceeds from the surface side toward the transparent substrate side, either in stages, or continuously, or partly in stages and partly continuously, with that etching rate set so that it becomes faster, as the transparent substrate side is approached from the surface side, either in stages, or continuously, or partly in stages and partly continuously.

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The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-27 are rejected under 35 U.S.C. 103(a) as being unpatentable Isao (5,605,776) in view of Mitsui (6,037,083).

The claimed invention is directed to a photomask blank comprising a substrate and a multilayer film thereon including at least four layers of different compositions, wherein the interface between the layers is moderately graded in composition.

And wherein said multilayer film includes layers composed mainly of compounds of metal silicide with oxygen and/or nitrogen; or said multilayer film includes at least one layer composed mainly of molybdenum silicide oxynitride.

The applicant discusses the limitations of the prior art in that when exposure is made through a mask having an inclined boundary geometry, the contrast of the mask pattern at the boundary becomes blurred. Only a low contrast is provided upon exposure of a very fine pattern. And that a photomask with a mask pattern having a minimal line edge roughness can be formed when the interface of each layer with an adjacent layer is moderately graded in composition.

Claim 16 recites a phase shift mask blank comprising a substrate and a phase shift film thereon, said phase shift film having one side contacting the substrate and a surface side remote therefrom, said phase shift film comprising a plurality of layers containing a metal and silicon in different compositional ratios which are stacked in such order that a

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layer having a higher etching rate is on the substrate side and a layer having a lower etching rate is on the surface side.

Isao et al. teach the rate of side etching with respect to the transversely central composition of the phase shifting layer.

The phase-shifting film comprises a film of molybdenum silicide oxide nitride deposited by sputtering a target of molybdenum silicide with a sputtering gas containing a nitrogen mono oxide gas, the arrangement being such that the proportion of said nitrogen mono oxide gas in said sputtering gas is adjusted to control said transversely central composition of the phase-shifting film.

And wherein said phase-shifting film comprises a plurality of layers successively deposited on said transparent substrate, said layers including a substantially central layer which has said transversely central composition which results in said reduced rate of side etching.

And wherein said plurality of layers comprise first through ninth layers, said substantially central layer comprising the fifth layer.

And wherein said phase-shifting film comprises a film of molybdenum silicide oxide nitride deposited by sputtering a target of molybdenum silicide with a sputtering gas containing a nitrogen mono oxide gas, the arrangement being such that the proportion of said nitrogen mono oxide gas in said sputtering gas is increased to produce said substantially central layer.

The teachings of Isao et al. differ from those of the applicant in that the applicant teaches adjusting the layer composition so that the etching rate becomes faster, as the

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transparent substrate side is approached from the surface side, either in stages, or continuously, or partly in stages and partly continuously.

Mitsui et al. is included here as discussed above.

It would have been obvious to one having ordinary skill in the art to take the teachings of Isao et al. and combine them with the teachings of Mitsui et al. in order to make the claimed invention because Mitsui et al. teach how to adjust the etch rate with composition of the layers.

Conclusion

Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Stephen Rosasco whose telephone number is (571) 272-1389. The Examiner can normally be reached Monday-Friday, from 8:00 AM to 4:30 PM. The Examiner's supervisor, Mark Huff, can be reached on (571) 272-1385. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



S. Rosasco
Primary Examiner
Art Unit 1756

S. Rosasco
04/10/07